

Annotated Bibliography of Bull Trout Information From the Jarbidge River Basin

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PREFACE

The following annotated bibliography was prepared on behalf of the Humboldt-Toiyabe National Forest. The purpose of the review was to annotate all readily-available information on bull trout (*Salvelinus confluentus*) from the Jarbidge River basin under one cover. Both published and unpublished materials were requested from agencies that have conducted fisheries work in the Jarbidge River basin. While the focus of the compilation was on bull trout, information on other fish species was also obtained and indexed.

Information obtained on bull trout from the Jarbidge River spans the period 1934 (Ref. 12) to 2001. Information was reviewed from previous field work performed by the State of Nevada, the State of Idaho, the United States Forest Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management, academic researchers, and the Southwest Basin Native Fish Watershed Advisory Group.

Although an effort was made to obtain the most recent version of all reports, some documents reviewed in this annotated bibliography were draft documents, and as such may contain information and/or conclusions that have subsequently been changed or modified. Any scientific data reviewed in this report has not been reviewed as to its scientific accuracy, and no claims are made as to the veracity of the data and/or conclusions of any document reviewed in this report.

Primary effort was spent in obtaining file data and reports from the following offices and individuals. An Internet search was also made for published materials that were not identified in our visits with the agencies. No publications were found that contained new information specific to bull trout in the Jarbidge River. Anecdotal and non-professional materials or information from several Internet websites were not included in this bibliography.

Idaho Department of Fish and Game, Jerome, ID
Doug Megargle

US Bureau of Land Management, Twin Falls, ID
Jim Klott

US Forest Service, Elko, NV
Kelly Amy

US Fish and Wildlife Service, Reno, NV
Selena Weldon

Nevada Division of Wildlife
Gary Johnson

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Source Key: 1 = Bureau of Land Management, Twin Falls, Idaho
2 = Idaho Department of Fish and Game, Jerome Idaho
3 = Nevada Department of Wildlife, Elko, Nevada
4 = United States Fish and Wildlife Service, Reno, Nevada
5 = United States Forest Service, Humboldt-Toiyabe National Forest, Elko, Nevada

1. **Bureau of Land Management (BLM) and United States Fish and Wildlife Service (USFWS). 1995.** Unpublished field notes and summary from bull trout survey in the Jarbidge Resource Area. Idaho Bureau of Land Management, Twin Falls, Idaho and USFWS Boise, Idaho. August 9, 1995. 9pp. **KEYWORDS:** DISTRIBUTION, REDBAND, STREAM HABITAT, TEMPERATURE. Source: 1

These notes are from an August 7 and 8, 1995 bull trout inventory on selected reaches in the West Fork and East Fork of the Jarbidge River, Jack Creek, and Deer Creek. Snorkeling was used as the sampling method. Redband were found at all sites, while bull trout were found only in Jack Creek. The data for Jack and Deer Creeks is presented in Table 1 under the entry for Zoellick et al. (1996).

2. **Burton, T., J. Klott, and B. Zoelick. 2001.** Field investigation of Dave Creek, tributary of EF Jarbidge River (September 11-13, 2001): Draft Report. Idaho Department of Fish and Game, Boise, Idaho. 7pp. Appendices. **KEYWORDS:** DISTRIBUTION, DISTURBANCE, LIVESTOCK, REDDS, SEDIMENT, STREAM HABITAT, SUBSTRATE. Source: 2.

This preliminary draft report presents the results of investigations of potential sediment effects to bull trout habitat resulting from the cattle crossing on Dave Creek and cattle trailing disturbances on the Little Island Tributary of Dave Creek. Methods included measurement of percent fines and substrate embeddedness based on the methods of Shepard, Platt, and Graham (1984). The resultant substrate score was then used to describe rearing habitat potential for bull trout. Findings showed that high levels of fine sediment were present both upstream and downstream of the Little Island Tributary, and that these elevated sediment levels likely originate from erosion of the degraded channel. Substrate samples taken upstream of the National Forest boundary showed a significant decrease of both fines and embeddedness. A stream "walk through" spawning habitat survey was also conducted on Dave Creek. Bull trout were observed actively spawning in Dave Creek from the National Forest Boundary to a point about 2 miles downstream. The authors estimate if Dave Creek substrates were to be restored, the estimated rearing capacity of the stream would increase nearly four-fold, the rearing space in Dave Creek would increase six-fold, and early lifestage survival would double in the upper 4 miles of the stream. Data presented includes habitat data, substrate score summaries, and predicted bull trout survival rates and population potentials for Dave Creek.

3. **Butler, C. 1997.** Hydrology specialist's report for proposal to reconstruct the Jarbidge Canyon Road from Pine Creek Campground to Snowslide Trailhead. US Forest Service, Ruby Mountains and Jarbidge Ranger Districts, Humboldt-Toiyabe National Forest. November 1996. 9pp. 5 Appendices. KEYWORDS: HYDROLOGY, ROADS, SEDIMENT, SUBSTRATE. Source: 5

This report consists of a hydrologic summary of the West Fork Jarbidge River, specifically in the reaches where the US Forest Service proposed to reconstruct the South Canyon Road from Pine Creek Campground upstream to Snowslide Trailhead. Historic hydrologic conditions were assessed, as well as possible impacts from reconstruction. Specifically, hydrologic flow paths, channel morphology, meander belts/valley bottom types, water quality, and cumulative effects are discussed. The report includes copies of field notes for flow and discharge calculations, valley bottom cross-sectional graphs, and pebble count information.

4. **Cavender, T.M. 1978.** Taxonomy and distribution of the bull trout, *Salvelinus malma* (Suckley), from the American Northwest. California Fish and Game 64(3):139-174. KEYWORDS: DISTRIBUTION, TAXONOMY. Source: 6

Morphological and distributional evidence is presented favoring the specific distinction of the bull trout. A diagnosis and description is given for the bull trout along with a history of its early taxonomy. The past and present distribution limits of the bull trout are listed, which includes the Jarbidge River system. Specific mention is made of bull trout collected in the West Fork Jarbidge River and in Dave Creek, a tributary of the East Fork Jarbidge River.

5. **Coffin, P.D. 1987.** Nevada's native trout: Status, distribution, and management. Nevada Division of Wildlife. Carson City, Nevada. KEYWORDS: DISTRIBUTION. Source:3

This report includes a very brief one-page description of the historic distribution of bull trout in North America and several non-referenced, anecdotal pieces of information on bull trout distribution in the Jarbidge River system.

6. **Frederick, J.A. 1996.** Specialist's report on the reconstruction of the Jarbidge Canyon Road. US Forest Service, Ruby Mountains and Jarbidge Ranger Districts, Humboldt-Toiyabe National Forest. November, 1996. 17pp. 4 Appendices. KEYWORDS: MINING, PASSAGE, ROADS, SEDIMENT, STREAM HABITAT, TEMPERATURE. Source: 5

This report addresses the US Forest Service proposal to reconstruct the South Canyon Road from Pine Creek Campground upstream to Snowslide Trailhead. The report includes an analysis of Jarbidge River fisheries and distribution of bull trout in the West Fork Jarbidge River. Several habitat elements are addressed with respect to both existing conditions, and possible future conditions if the project were completed. These elements include habitat connectivity, width/depth ratio, water temperature, large wood, and pool quantity and quality. Other considerations addressed in the report include migration/passage issues, sediment influx, and current Fox Creek Bridges. Cumulative effects that the project may contribute to were examined. Specifically these include channelization, large wood and vegetation removal, road maintenance, historic mining operations, and the Jarbidge Land Fill. The report concludes that the project may impact bull trout habitat in the short and long term, particularly by increasing summer stream temperature and modifying habitat through reductions of large wood and pools and changes in channel morphology. The report includes Appendices of 1996 LWD and pool survey data.

7. **Frederick, J.A. and J. Klott. 1999.** Biological Assessment of ongoing activities and proposed actions in the Jarbidge River Watershed. US Forest Service, Northwest Nevada Ecounit, Humboldt-Toiyabe National Forest, Elko Nevada, and Bureau of Land Management, Jarbidge Resource Area, Boise District, Idaho. June 24, 1999. KEYWORDS: BIOLOGICAL ASSESSMENT, DISTRIBUTION, ENVIRONMENT, IDAHO, LIVESTOCK, MAINSTEM JARBIDGE RIVER, MANAGEMENT, MINING, POPULATION DENSITY, RECREATION, ROADS, STREAM HABITAT, WATER QUALITY. Source: 5

The stated purposes of the biological assessment are to identify land management activities that currently are or have the potential to adversely affect threatened, endangered, proposed, or candidate species on land administered by the BLM or USFS, and to evaluate the adequacy of the Humboldt National Forest Land and Resource Management Plan (LRMP) in protecting and enhancing aquatic habitat, specifically bull trout habitat. A description of the physical setting and vegetation of the Jarbidge River watershed is presented. Descriptions of the mainstem and East and West Forks of the Jarbidge River are included, with all named tributaries described. A discussion of listed or candidate species found in the Jarbidge River system, including bull trout, is presented with bull trout focal habitat listed. A description of agricultural-related activities and a biological assessment of these activities are given. Individual biological assessment sections are found on the topics of mineral exploration and reclamation, hazardous waste, urban development, recreation, existing roads, and road construction and maintenance, and the Humboldt National Forest LRMP. The biological assessment for bull trout was "may effect, likely to adversely affect" for the following activities: livestock grazing in the Wilkens Island grazing area; the current configuration of the Jarbidge Canyon Road and associated bridges; historic and current road construction and maintenance practices on Jarbidge Canyon Road; and road construction and maintenance as occurring under the Humboldt LRMP, as amended. All other activities resulted in a "no effect" or "may affect, not likely to adversely affect" finding. The Appendices include 1997 water quality data at various locations in the Jarbidge River watershed, and a table of the streams and fish use of the Jarbidge River system.

8. **Johnson, G.L. 1990.** Bull trout species management plan. Nevada Department of Conservation and Natural Resources. Division of Wildlife, Reno, Nevada. 18pp. KEYWORDS: ANGLING, CATCH STATISTICS, CREEL CENSUS, DISTRIBUTION, LENGTHS, MANAGEMENT, POPULATION DENSITY, REDBAND, STOCKING, STREAM HABITAT. Source: 3

The stated purpose of the document is to provide the basis for decision-making regarding the bull trout through evaluation of management alternatives to achieve department objectives, as well as the identification of projects needing evaluation in future surveys. Bull trout taxonomy, a description of the species, and some background life history information is presented, including a short analysis of bull trout interrelationships with other species. Current angler harvest trends are noted. A status summary of the management program is presented with several management alternatives. Several areas are recommended for future study, including population delineation studies, life history studies, investigation of stocking prohibitions, and investigation of species eradication and/or reintroductions. Historical data presented include a composite information summary of bull trout in Jarbidge River tributaries in Nevada, and a summary of West and East Fork Jarbidge river electrofishing surveys. A table of potential bull trout inhabited stream reaches without current inventories is also included, with predicted bull trout status for these unsurveyed reaches. A map of the Jarbidge system is included, with estimated bull trout populations from previous surveys noted.

9. **Johnson, G.L. and D.E. Weller. 1994.** The status of bull trout in Nevada. Nevada Department of Conservation and Natural Resources. Division of Wildlife, Reno, Nevada. September, 1994. 14pp. KEYWORDS: ANGLING, CATCH STATISTICS, DACE, DISTRIBUTION, GEOLOGY, LENGTHS, MOUNTAIN WHITEFISH, POPULATION DENSITY, REDBAND, SCULPIN, STREAM HABITAT, SUBSTRATE. Source: 3

The purpose of this report is to clarify the status of bull trout in the Jarbidge River drainage, Nevada. Historical data from 1958-1979 are reviewed and summarized, as they pertain to bull trout abundance and distribution. Historic data on angler use trends and angler harvest are summarized. Population estimates from these data vary widely, from 0 to 929. More current population estimates were examined for the years 1985 (West Fork Jarbidge) and 1993 (East Fork Jarbidge) with respect to multiple species. The estimates given are a population of 292 bull trout and 15,156 rainbow trout in the West Fork Jarbidge and 314 bull trout and 4,123 rainbow trout in the East Fork Jarbidge. Population estimates for some of the tributaries are also given. A comparison of stream bottom substrate composition is given for both forks of the Jarbidge River, based on recent stream habitat survey data. The West Fork Jarbidge shows a higher percentage of sand/silt substrate than does the East Fork Jarbidge (7 percent compared to 4 percent), although it also shows a lesser percent embeddedness (12.5 percent compared to 16.0 percent). A comparison of the East Fork and West Fork Habitat Condition Index and stream discharge information is also given. General tributary stream conditions are discussed, including temperature regimes. Bull trout habitat conditions are listed and focal habitat areas are given. The streams of the Jarbidge River system are classified into four categories, Focal Habitat, Nodal Habitat, Critical Conditioning Areas, and Adjunct Habitat. The report concludes with a statement that due to present habitat condition of focal habitats, current land management practices, and other factors, bull trout are expected to persist in the system.

10. **Johnson, G.L. 1999.** The status of bull trout in Nevada. Nevada Department of Conservation and Natural Resources. Division of Wildlife, Reno, Nevada. March 30, 1999. 23pp. KEYWORDS: DACE, DISTRIBUTION, LENGTHS, POPULATION DENSITY, REDBAND, SCULPIN, STREAM HABITAT, TEMPERATURE. Source: 3

This report summarizes an intense survey of bull trout in the Jarbidge River system in late summer and fall 1998. The information collected was meant to supplement earlier population status studies (Johnson et al. 1993). A combination of snorkeling and electrofishing was used at a variety of sites on the West Fork Jarbidge River, Jack Creek, Jenny Creek, Pine Creek, Sawmill Creek, Dave Creek, Fall Creek, Slide Creek and the East Fork Jarbidge River. Thermographs were also set up at several of these sites. Bull trout were captured in numerous locations, including the upper West Fork Jarbidge, Pine Creek, Sawmill Creek, upper East Fork Jarbidge, Dave Creek, Slide Creek, Fall Creek, and Cougar Creek. Results include minimum population estimates of bull trout, redband, and several other species for both the West and East Forks of the Jarbidge River. The appendices include a summary of all captured bull trout lengths, and a comparison of bull trout trend data incorporating this survey with historical survey efforts dating back to 1954. Maps are included showing the current known distribution limits of bull trout, and any known or likely fish migration barriers.

11. McNeill, M.E., J. Frederick, B. Whalen. 1997. Jarbidge River Watershed Analysis. US Forest Service. Jarbidge Ranger District, Humboldt-Toiyabe National Forest, Elko Nevada. 43pp. KEYWORDS: BEAVER, DISTURBANCE, GEOLOGY, LIVESTOCK, MINING, ROADS, SOILS, STREAM HABITAT, SUBSTRATE, TEMPERATURE, VEGETATION. Source: 5

This document has several stated purposes. These include the documentation of existing conditions within the Jarbidge River watershed, the identification of any weaknesses in the data, and in providing an overview of ongoing activities within its boundaries. The physical setting of the watershed is discussed, including the slope, geology, soils, disturbance history, and existing land use. The Jarbidge River is then assessed with respect to stream order, hydraulic regime, valley bottom morphology, channel morphology, substrate, width/depth ratio, pools, and large wood. Water quality is examined, including a discussion of pH, temperatures, and presence of heavy metals. Upland and riparian vegetation are also typed and described. Color maps are included as key parts of these analyses. Specific reference conditions assessed include both biological processes, such as the history of beaver in the river system, and human influences, such as extensive livestock grazing and mining activity in the basin. Specific effects of mining noted include direct effects on water quality, stream temperature, and riparian and upland vegetation as well as indirect effects such as increased road building and changes in channel morphology. The report interprets the historical and current watershed conditions and identifies key concerns in improving watershed conditions. It asserts that habitat modification and mining practices may have drastically reduced bull trout numbers from 1885 to 1945. The report concludes with a list of recommendations for management efforts and restoration of natural dynamics and suggestions for data collection to bridge the current shortcomings. These suggestions include conducting a limiting factors analysis, long term stream temperature studies, further stream flow characterization, and further surveys to characterize riparian vegetation.

12. Miller, R.R. and W.M. Morton. 1952. First record of the Dolly Varden, *Salvelinus malma* from Nevada. Copeia, 3:207-208. KEYWORDS: DISTRIBUTION, LENGTH. Source: 4

This article documents the collection of the first documented record of bull trout (Dolly Varden) in Nevada. During an August 27, 1934 survey for the U.S. Department of Fisheries, S.D. Durrant identified two bull trout (105 and 169mm in length) that were collected in Dave Creek, 4 miles above its confluence with the East Fork Jarbidge River. Two universities morphologically identified these specimens as bull trout (Dolly Varden). In 1951, an additional three bull trout (168-193mm in length) were collected in the East Fork Jarbidge River.

- ✓ 13. Nevada Division of Wildlife (NDOW). 1954. Unpublished field data and report from West Fork Jarbidge River field survey, June and August 1954. KEYWORDS: BROOK TROUT, CUTTHROAT TROUT, DISTRIBUTION, ENVIRONMENT, REDBAND, STREAM HABITAT, TEMPERATURE. Source: 5

This report discusses a 1954 field survey on the West Fork of the Jarbidge River between Bourne Gulch and Sawmill Creek. Six stations were electrofished and some habitat and temperature data were gathered at some of the stations. The fish sampled included two bull trout, both shocked at a site located between Sawmill Creek and Dry Gulch. Rainbow trout were reported as the most abundant species. Limitations in electroshocking success were noted. A general description of the geography and physical characteristics of the river are given, and plants, animals, and insects in the area were noted. Historic mine pollution is also discussed. A graph of valley gradient is included.

14. **Nevada Division of Wildlife (NDOW). 1961.** Unpublished field data and report from West Fork Jarbidge River field survey, October 1961. KEYWORDS: ANGLING, BROOK TROUT, CUTTHROAT TROUT, DISTRIBUTION, LENGTH, REDBAND, SCULPIN. Source: 5

This report discusses a 1961 limited population study on the West Fork Jarbidge River between the Nevada State line and Sawmill Creek. The report summarizes the results of 22 spot creel checks during the year and compares it with similar, although limited data from 1956-1960. Based on the surveys, estimated angler pressure for 1961 was 500 to 1000 days, with twenty percent of rainbow trout being of hatchery origin. Seven stations were electrofished in early October 1961, and some habitat and temperature data were gathered at some of the stations. Rainbow trout were reported as the most abundant species with approximately 10 percent being of hatchery origin. No eastern brook trout or cutthroat were observed although 5000 pounds of eastern brook trout have been stocked since 1954. This indicates the species inability to survive or reproduce in the West Fork Jarbidge. Three bull trout were captured just above the mouth of Sawmill Creek.

15. **Nevada Division of Wildlife (NDOW). 1962.** Unpublished angler survey data and report from West Fork Jarbidge River field survey, 1962. KEYWORDS: ANGLING, BROOK TROUT, CATCH STATISTICS, CREEL CENSUS, LENGTHS, MOUNTAIN WHITEFISH, REDBAND. Source: 5

This report summarizes the 1962 creel census activity on the West Fork Jarbidge River. Specific locations of the surveys were not given. Rainbow trout were reported as the most abundant species with approximately 25 percent being of hatchery origin. Only four eastern brook trout and no cutthroat were observed. A total of nine bull trout, averaging 192mm, were caught.

16. **Nevada Division of Wildlife (NDOW). 1972.** Unpublished field data from West Fork Jarbidge River field survey, August 1972. KEYWORDS: DISTRIBUTION, LENGTHS, REDBAND, STREAM HABITAT. Source: 5

This data is from an August 1972 field survey on the West Fork of the Jarbidge River between the National Forest Boundary and Snowslide Creek. Four stations were electrofished in this reach. Rainbow trout were reported as the most abundant species averaging between 45-100 percent of catch by site. One 162-mm bull trout was captured at the confluence of Jack Creek. Stream game fish habitat surveys were also conducted at the four stations.

17. **Nevada Division of Wildlife (NDOW). 1974.** Unpublished field data from West Fork Jarbidge River field survey, November 1974. KEYWORDS: DISTRIBUTION, LENGTHS, MOUNTAIN WHITEFISH, REDBAND, SCULPIN. Source: 5

These data are from a November 1974 field survey on the West Fork Jarbidge River between the State line and Snowslide Creek. Six stations were electrofished in this reach. Rainbow trout were reported as the most abundant species and were present at every station. No bull trout were captured.

18. **Nevada Division of Wildlife (NDOW). 1975.** Unpublished field data and summary from West Fork Jarbidge River field survey, September 1975. KEYWORDS: ANGLING, CATCH STATISTICS, DISTRIBUTION, CREEL CENSUS, LENGTHS, REDBAND. Source: 5

These data are from a September 1975 field survey on the West Fork Jarbidge River between the State line and Snowslide Creek. Seven stations were electrofished in this reach. Rainbow trout were reported as the most abundant species and were present at every station. No bull trout were captured. An angler survey of 7 anglers showed an average success of 2.71 fish per angler day. Annual angler pressure was estimated at 3,830 angler days for 1975. The capture of "several" Dolly Varden by anglers were noted to have occurred in 1975, including a specimen of 425mm.

19. **Nevada Division of Wildlife (NDOW). 1979.** Unpublished field data and summary from West Fork Jarbidge River field survey, October 1979. KEYWORDS: ANGLING, DISTURBANCE, LENGTHS, POPULATION DENSITY, REDBAND, ROADS, SEDIMENT, STREAM HABITAT, SUBSTRATE. Source: 5

The purpose of this report is to compare fish use and habitat quality in unchannelized reaches and reaches channelized by the USFS in 1979. The habitat survey was conducted using the GAWS method, with variable reach lengths and spacing. The electrofishing data is from an October 1979 field survey on the West Fork Jarbidge River between the Mahoney Ranger Station and Pine Creek Campground. Ten sites (5 channelized, 5 unchannelized) were electrofished in this reach. Two bull trout were captured just above and below the town of Jarbidge. The rainbow population in the channelized reaches was only 7% of the levels in the natural channels. A stream habitat survey was also conducted at the electrofishing sites. The summary notes the channelized sections were narrower, shallower, and faster with less sedimentation and a higher velocity than the natural channel. Also, spawning gravels in the natural reaches were of significantly better quality and quantity. The summary concludes that the West Fork Jarbidge River shows a significant impact to fish and their habitat from the 1979 channelization of 3,104 feet of the stream and recommendations are made regarding the channelization.

20. **Nevada Division of Wildlife (NDOW). 1980.** Unpublished field data and summary from West Fork Jarbidge River field survey, October 1980. KEYWORDS: DISTURBANCE, LENGTH, POPULATION DENSITY, REDBAND, ROADS, SEDIMENT, STREAM HABITAT, SUBSTRATE. Source: 5

The purpose of this report is to compare fish use and habitat quality in unchannelized reaches and reaches channelized by the USFS in 1979 to results from the previous years study (NDOW 1979). The electrofishing data is from an October 1980 field survey on the West Fork of the Jarbidge River between the Mahoney Ranger Station and Pine Creek Campground. Six sites (3 channelized, 3 unchannelized) were electrofished in this reach. Bull trout were captured at two sites, one channelized and one natural. Data on numbers of bull trout captured and length data are lacking. A stream habitat survey was also conducted at the electrofishing sites. The summary notes substantial differences in bank cover and stream environment with the natural reaches receiving much higher ratings. Spawning gravel quantity was higher in the natural reaches, but had decreased by half from the 1979 surveys.

21. **Nevada Division of Wildlife (NDOW). 1985.** Unpublished field data from West Fork Jarbidge River field survey, September-October, 1985. KEYWORDS: DISTRIBUTION, IDAHO, LENGTHS, REDBAND, STREAM HABITAT, SUBSTRATE. Source: 5

These data are from a 1985 field survey on the West Fork Jarbidge River of 17 selected reaches from State line to near Sawmill Creek. GAWS survey protocol was used with 1 mile spacing between surveyed reaches. Each surveyed reach consisted of five transects spaced 138 feet apart, for a total of 690 feet of stream sampled. All 17 stations were electrofished, and a total of 13 bull trout were captured. 12 of the 13 bull trout captured were in the upper West Fork Jarbidge, from Snowslide Gulch to Sawmill Creek. A stream habitat survey was also conducted at each of the stations.

22. *Johnson and Hackin*
Nevada Division of Wildlife (NDOW). 2000. Unpublished Section 6 Annual Project Report (1999) for Recovery action for bull trout in Jarbidge River Drainage system. Period covered- January 1, 1999 to December 31, 1999. KEYWORDS: AGE, DISTRIBUTION, REDBAND, STREAM HABITAT, TEMPERATURE. Source: 3

This report documents and summarizes bull trout studies carried out by NDOW in 1999 to delineate the population status and upstream distribution of bull trout in selected streams. Jack Creek, Pine Creek, and the East Fork Jarbidge River were all electrofished. Bull trout were found in all three surveys, representing several age classes. Jack Creek had 14 Age II and adult bull trout, which was the first time bull trout had been found in the stream since the replacement of the culvert at the mouth in 1997. Several of the bull trout captured in Pine Creek were of a size (up to 296mm) that may represent fluvial migrants. The original goal of electrofishing the Right Headwaters Fork of the East Fork Jarbidge River could not be achieved due to no suitable flows (mostly dry) in that reach. Thermographs were deployed in Pine, Robinson, Fall, Dave, Jack and Cougar Creeks as well as the Upper East Fork Jarbidge River. The period of record was from roughly early to mid-July to early to mid-October. From the 1998-99 temperature records it was found that the three focal bull trout areas (upper West Fork Jarbidge River, upper East Fork Jarbidge River, and upper Dave Creek) are the coldest fish bearing stream reaches in the Jarbidge River. A discussion of which particular temperature metric is most important in determining bull trout occupancy is also given.

23. **Nevada Division of Wildlife (NDOW). 2001.** Unpublished Annual Project Report (2000) for Eastern Region Native Fisheries Management: Bull trout. Period covered- January 1, 2000 to December 31, 2000. KEYWORDS: DISTRIBUTION, TEMPERATURE, REDBAND, STREAM HABITAT. Source: 3

This report documents and summarizes bull trout studies carried out by NDOW in 2000. Portions of the West Fork Jarbidge River from Jack Creek to Pine Creek were snorkeled, as was Jack Creek. Bull trout were found in both surveys. The full length of Robinson Creek was intensively surveyed with electrofishing, and no bull trout were found. Intensive spot-shocking resulted in no bull trout in Lower Fox Creek, while it resulted in one 220-mm bull trout in Deer Creek, found in a 70° F pool. Thermographs were deployed in Bear Creek, Upper Deer Creek tributary, and Fox Creek to assess these streams as bull trout habitat. The temperature records for both Upper Deer Creek tributary and Bear Creek were deemed unsuitable for bull trout juvenile rearing habitat, while Fox Creek may be considered marginally suitable bull trout juvenile rearing habitat.

24. **Parrish, D. 1998.** Jarbidge Key Watershed Bull Trout Problem Assessment. South West Basin Native Fish Watershed Advisory Group. December 1988. 24pp. 4 Appendices. KEYWORDS: DISTRIBUTION, GEOLOGY, IDAHO, LAND USE, LIFE HISTORY, LIVESTOCK, MAINSTEM JARBIDGE RIVER, MINING, ROADS, SUBSTRATE, TEMPERATURE. Source: 1

The document was prepared according to the State of Idaho Bull Trout Conservation Plan as a problem assessment for bull trout in the Jarbidge River System. Recommendations are focused on the geographical area of the East and West Forks of the Jarbidge River from the Idaho-Nevada boundary to their confluence. A brief physical description of the area includes information on climate, hydrology, and geology/landform. Historic and current bull trout distribution and abundance is briefly examined. Habitat conditions and trends with respect to parameters such as channel and hydrologic stability, substrate size and compositions, cover complexity, migration barriers, and temperature are also addressed. Watershed characteristics influencing bull trout are listed as geologic processes, stream flow regime, and land use practices. The land use practices addressed include roads, mining, forestry, agriculture/livestock, fire, urban encroachment, and recreation. Additional limiting factors listed include habitat degradation, harvest or over-utilization, exotic species, and predation. Several conservation actions are recommended. The appendices include summary tables of Warren and Partridge (1993) habitat data, and temperature data from 1994 and 1997 (Partridge, 1998).

25. **Partridge, F.E. and C.D. Warren. 1998.** Monitoring of migrating bull trout in the Jarbidge River. Idaho Bureau of Land Management. Boise, Idaho. Technical Bulletin No. 98-9. June 1998. 15pp. KEYWORDS: DACE, DISTRIBUTION, IDAHO, LENGTHS-WEIGHT, MIGRATION, MOUNTAIN WHITEFISH, REDBAND, SCULPIN, SUCKER, TEMPERATURE, WEIR TRAPS. Source: 1

The report presents data from the placement of temporary fish weirs and trapboxes in the East and West Forks of the Jarbidge River near their confluence in Idaho. The weirs were constructed to trap downstream migrants. The trap boxes were checked daily from late August to mid-October 1997. Total length measurements were taken on all trout captured. Continuous temperature data were also recorded at the weir sites using thermographs placed at both sites. The purpose of the project was to count bull trout migrating downstream after spawning, to develop an index of the population of the migratory bull trout population in the two forks, and to obtain information on other migratory native fish in the basin. Data presented includes tables of length frequencies and average weights of some of the fish sampled, and daily mean temperature, as well as graphs plotting daily temperature and fish presence by species over the study period. A single bull trout was sampled on the West Fork Jarbidge River. Over four times as many rainbow trout were sampled in the East Fork Jarbidge River as the West Fork, and all species except bull trout and shorthead sculpin were found in greater numbers in the East Fork.

26. **Partridge, F.E. and C.D. Warren. 2000.** Monitoring of migrating bull trout in the Jarbidge River, 1999. Idaho Bureau of Land Management. Boise, Idaho. Technical Bulletin No. 00-1. November 2000. 19pp. KEYWORDS: DACE, DISTRIBUTION, IDAHO, LENGTHS-WEIGHT, MIGRATION, MOUNTAIN WHITEFISH, REDBAND, SCULPIN, SUCKER, TEMPERATURE, WEIR TRAPS. Source:1

This report summarizes data from the second year of a 2-year study begun with Partridge and Warren 1998, presenting data from the placement of temporary fish weirs and trapboxes in the East and West Forks of the Jarbidge River near their confluence in Idaho. The placement of the East Fork Jarbidge trap box was identical to the 1997 study, while the West Fork Jarbidge River trap box was moved downstream, approximately 1.7 km closer to the confluence. The weirs were constructed to trap downstream migrants. The trap boxes were checked daily from September 8 to August 30, 1999. Total length measurements were taken on all trout. Continuous temperature data were also recorded at the weir sites using thermographs placed at both sites. The purpose of the project was to count bull trout migrating downstream after spawning, to develop an index of the population of the migratory bull trout population in the two forks, and to obtain information on other migratory native fish in the basin. Similar to the 1997 study, data presented includes tables of length frequencies, average weights of some of the fish sampled, daily mean temperature, as well as graphs plotting daily temperature and fish presence by species over the study period. A table is also included indicating number of fish (by species) sampled by date for both 1987 and 1999 data. A total of five bull trout were captured between the two sites, ranging in size from 250 to 355mm.

27. **Ramsey, K.J. 1997a.** Biological evaluation for bull trout (*Salvelinus confluentus*), written for the Jarbidge Road Reconstruction Environmental Assessment. US Forest Service, Northwest Nevada Ecounit, Humboldt-Toiyabe National Forest, Elko Nevada. March 21, 1997. 81pp. 5 Appendices. KEYWORDS: BIOLOGICAL ASSESSMENT, DISTRIBUTION, FOOD, HYDROLOGY, PASSAGE, POPULATION DENSITY, REARING, REDBAND, ROADS, SEDIMENT, STREAM HABITAT, TEMPERATURE, WATER QUALITY. Source: 5

This biological evaluation assesses the effects on bull trout of a proposed action of reconstructing a road in the Jarbidge Canyon that was obliterated and/or damaged by the June, 1995 flood. The purpose of this proposed action is recovery of 1.5 miles of vehicle access along Forest Service Road #64 from Pine Creek Campground to the Snowslide Trailhead. The proposed action would require the relocation of 700ft of stream channel. The proposed action was analyzed, along with an alternative (trail construction) and the no action alternative (existing conditions). The report assesses current conditions in the project area, including habitat conditions on the West Fork Jarbidge River. Large woody debris, pool frequency, wetted width:depth ratio, and temperature conditions are discussed relative to current and historical conditions. It is noted that there is a notable lack of large wood in the project area, as compared to above the Wilderness boundary, and that pool frequencies are less than expected for most channel types. The results of a 1996 habitat and LWD survey, conducted by the USFS, are presented in the Appendices. These surveys were conducted on the West Fork Jarbidge River from Pine Creek to Dry Gulch, and they encompass the area where work on the proposed action would occur. Bull trout population distribution and status is evaluated in the report, with note of metapopulation and migratory life history. The author concurs with Johnson and Wellers' (1994) assessment that the Jarbidge River bull trout population is low, but persistent.

A summary of bull trout population information for the Jarbidge River system is included. Effects of the project alternatives on bull trout for the following parameters are discussed: large wood, pools, width:depth ratio, water temperature, water quality, bull trout prey base, channel dynamics, fish passage, sediment, and spawning and rearing habitat. The risk determination was that all of the alternatives "may impact individuals or habitat, but will not likely cause a loss of viability to the population or species". The no-action alternative and trail alternative were said to result in a trend toward Desired Future Condition, while the road alternative was said to result in a trend away from Desired Future Condition. Recommendations were made to reduce the risk of negative outcomes of project implementation, and for maintaining and recovering viable populations of bull trout throughout the West Fork watershed. Appendices include historic data summaries of temperature data, width:depth ratio data, and bull trout presence in the West Fork Jarbidge and tributaries, as well as a literature and data review of bull trout life history and habitat requirements in the West Fork Jarbidge. A summary of a stream walk conducted in October 1992 notes several bull trout observed in the upper reaches of the West Fork Jarbidge.

28. **Ramsey, K.J. 1997b.** Unpublished memo on field trip to West and East Fork Jarbidge River field survey, US Forest Service, Humboldt-Toiyabe National Forest, Elko Nevada. October 15, 1997. KEYWORDS: REDDS, STREAM HABITAT, SUBSTRATE. Source:3

The memo discusses a field trip to the West and East Forks of the Jarbidge River that took place October 6-8, 1997. In the East Fork Jarbidge River the purpose was to take visual observations of fish, redds, and spawning gravels. The investigation in the East Fork was from the National Forest Boundary to about .25 mile inside the Wilderness boundary, a total distance of about 2.0 miles. Multiple age classes of redband were observed, but no bull trout or bull trout redds were observed. It was noted that spawning sized gravels accumulated predominantly at the channel margins. The mid-channel substrate was predominantly cobble, and appeared to be relatively stable. Pool frequency and large wood were measured, and found to be substantially less than expected (per Overton et al. 1995). The investigation of the West Fork Jarbidge River was from the Pine Creek confluence to 50 yards below Sawmill Creek. The purpose was to search for bull trout, spawning materials, and redds. Numerous redband were observed, as well as three mature bull trout. Two "probable redds" were found above Dry Gulch, one in a pool tail area and one in a riffle. They were estimated to be at least 2 weeks old. It was noted that spawning gravel-sized material was more prominent in the wilderness, as compared to downstream, and that gravels did not accumulate readily in ideal spawning locations, such as pool tailouts. Cobble substrate did not appear as stable as in the East Fork.

29. **Stowell, R., S. Wolterling, L. Brown, and D. Mason. 1998.** Biological Assessment: Effects to bull trout, shortnose sucker, and Warner sucker of land and resource management plans and associated federal actions on National Forests and Bureau of Land Management Resource Areas in the Columbia River, Klamath River, and Jarbidge River Basins. US Forest Service, Northern Region, Missoula, Montana. June 15, 1998. 55pp., 2 Appendices. KEYWORDS: BIOLOGICAL ASSESMENT, MANAGEMENT. Source: 5

This biological assessment of the effects of implementing all BLM and USFS planning and decision documents bull trout, shortnose sucker, and Warner Sucker in the Columbia River, Klamath River, and Jarbidge River basins. The Jarbidge River sub-basin is examined for Land and Resource Management Plans (LRMOs) specific to INFISH implementation. Possible positive and negative effects on these listed species is examined, and a determination of 'may effect and are likely to adversely effect' is found for the Jarbidge River bull trout DPS.

30. **United States Department of the Interior (USDI). 1999.** Endangered and threatened wildlife and plants: Determination of threatened status for the Jarbidge River population of bull trout. Federal Register 64:17110-17125. KEYWORDS: DISTRIBUTION, DISTURBANCE, GENETICS, LIFE HISTORY, LIVESTOCK, MANAGEMENT, METAPOPULATION, MINING, OVERFISHING, POPULATION DENSITY, PREDATION, ROADS. Source:4

This Federal Register Final Rule covers the determination of threatened status for the Jarbidge River distinct population segment of bull trout from the Jarbidge River system in northern Nevada and southern Idaho. The listing includes general background information on bull trout life history, habitat requirements, and the applicability of biological metapopulation concepts to bull trout distribution. Bull trout status and distribution in the Jarbidge River system is discussed. The lack of data to determine population trends, and the apparent current and historic low numbers of bull trout in the system are noted as contributing factors for the listing. The results of recent preliminary data from genetic analysis of Jarbidge River bull trout indicates the potential presence of multiple, tributary-resident bull trout subpopulations, with limited gene flow among them, although the information was currently insufficient to divide the Jarbidge River DPS into more than one subpopulation. The five factors that apply to the listing of a species are discussed along with their application to the Jarbidge River population segment of bull trout. These include land management activities, road construction, livestock grazing, mining, overutilization by angling, introduction of non-native fish species, and high gradient stream channel, among others. The listing recommends conservation methods and gives responses to public comments on the listing.

31. **United States Fish and Wildlife Service (USFWS). 1998.** Biological Opinion on stabilization of the West Fork Jarbidge River, Elko County, Nevada. U.S. Fish and Wildlife, Nevada Fish and Wildlife Office, Reno, Nevada. Nov 5, 1998. 31pp. KEYWORDS: BIOLOGICAL OPINION, DISTRIBUTION, DISTURBANCE, LIFE HISTORY, POPULATION DENSITY, ROADS. Source:

4

This document represents the Fish and Wildlife Service's Biological Opinion of the effects of the US Forest Service's proposed action for stabilization of the West Fork Jarbidge River, and its effect on bull trout. Status of bull trout and bull trout critical habitat is discussed in general, and with respect to the Jarbidge River population. Environmental baseline conditions are discussed including historic and ongoing threats to the Jarbidge River bull trout population. Effects of the proposed action on bull trout are analyzed for direct, indirect, and cumulative effects. The Service concluded that the proposed action is not likely to jeopardize the continued existence of bull trout in the Jarbidge River DPS. Reasonable and prudent measures, terms, and conditions are defined for this action, and conservation recommendations are made.

32. **United States Fish and Wildlife Service (USFWS). 2000.** Draft Biological Opinion on effects to bull trout from continued implementation of the U.S. Forest Service Humboldt National Forest Land and Resource Management Plan, as amended by INFISH. U.S. Fish and Wildlife, Nevada Fish and Wildlife Office, Reno, Nevada. 88pp. KEYWORDS: BIOLOGICAL OPINION, DISTRIBUTION, DISTURBANCE, LIFE HISTORY, LIVESTOCK, MANAGEMENT, MINING, RECREATION, ROADS, STREAM HABITAT. Source: 4

This document represents the Fish and Wildlife Service's Biological Opinion of the effects of continued implementation of the Humboldt NF Land and Resource Management Plan, as amended by INFISH, on listed bull trout in the Jarbidge River Distinct Population Segment (DPS). Environmental baseline conditions are discussed, including the status of bull trout in the Jarbidge River DPS. General threats to the Jarbidge River bull trout population that are discussed include forest land management, livestock grazing, dams, fire management, and mining. Effects of specific management activities, including management of roads, grazing, recreation, minerals, fire/fuels, and general riparian area are assessed, as are watershed, fisheries, and wildlife restoration efforts. The Service concluded that the proposed action is not likely to jeopardize the continued existence of bull trout in the Jarbidge River DPS. Reasonable and prudent measures, terms, and conditions are defined for this action, and conservation recommendations are made.

33. **United States Fish and Wildlife Service (USFWS). 2001.** Biological Opinion on effects to bull trout from continued implementation of the Bureau of Land Management Jarbidge Resource Area and Resource Management Plan, as amended INFISH. U.S. Fish and Wildlife, Nevada Fish and Wildlife Office, Reno, Nevada. April 27, 2001. 90pp. KEYWORDS: BIOLOGICAL OPINION, DISTRIBUTION, DISTURBANCE, GENETICS, LIFE HISTORY, LIVESTOCK, LOGGING, MANAGEMENT, MINING, ROADS, SEDIMENT, WATER QUALITY. Source: 4

This document represents the Fish and Wildlife Service's Biological Opinion of the effects of continued implementation of the Jarbidge Resource Area and Resource Management Plan, as amended, on listed bull trout in the Jarbidge River Distinct Population Segment (DPS). A summary of the status of bull trout in the Jarbidge River DPS is included, listing historic and current distribution, life history characteristics, and habitat requirements. Environmental baseline conditions are discussed, including the status of bull trout in the action area. General threats to the Jarbidge River bull trout population are discussed, and include forest land management, livestock grazing, dams, urban development, fire management, and mining. Other factors considered in the environmental baseline include INFISH implementation, forest practices, water quality standards, and fisheries management by the states of Idaho and Nevada. Effects of specific management activities, including management of roads, grazing, recreation, minerals, fire/fuels, and general riparian area are assessed, as are watershed, fisheries and wildlife restoration efforts. Reasonable and prudent measures, terms, and conditions are defined for this action, and conservation recommendations are made.

34. **United States Forest Service (USFS). 1971.** Unpublished field data from West Fork Jarbidge River field survey, August 1971. KEYWORDS: STREAM HABITAT, SUBSTRATE. Source: 5

These data are from a habitat survey conducted on the West Fork Jarbidge in August, 1971. The downstream survey limit was the National Forest Boundary and the upstream limit was near Snowslide Gulch. The survey used the GAWS method with reaches 500 feet in length, located 0.33 miles apart. Five transects were taken for each reach.

35. **United States Forest Service (USFS). 1992.** Unpublished field data from Pine Creek field survey, August 1992. KEYWORDS: STREAM HABITAT, SUBSTRATE. Source: 5

These data are from a GAWS habitat survey conducted on Pine Creek in August, 1992. The downstream survey limit was the confluence with the West Fork of the Jarbidge River and the upstream limit was at elevation 8159 feet. The survey used the GAWS method.

36. **United States Forest Service (USFS) and Nevada Division of Wildlife (NDOW). 1993.** Unpublished field data and summary from East Fork Jarbidge River field survey, June-October, 1993. KEYWORDS: DISTRIBUTION, REDBAND, STREAM HABITAT, SUBSTRATE. Source: 5

The objectives of the study were to conduct intensive habitat and fish population surveys on about 65 miles of the stream within the East Fork Jarbidge River Drainage. The habitat data are from a joint Level 3 GAWS analysis conducted in conjunction with electrofishing surveys. The downstream survey limit on the East Fork Jarbidge was the National Forest Boundary and the upstream limit was near the headwater forks. Tributaries surveyed included Cougar, Dave, Fall, Gods Pocket, Jim Bob, Robinson, and Slide Creeks. Bull trout were found in the Upper East Fork Jarbidge River and in Dave, Fall, and Robinson Creeks.

37. **United States Forest Service (USFS). 1997a.** Environmental assessment; Proposal to Reconstruct the Jarbidge Canyon Road from Pine Creek Campground to Snowslide Trailhead. US Forest Service, Humboldt-Toiyabe National Forest, Elko Nevada. KEYWORDS: BIOLOGICAL ASSESSMENT, MANAGEMENT, ROADS, STREAM HABITAT. Source: 5

This document assesses the proposed action of reconstructing a road in the Jarbidge Canyon that was obliterated and/or damaged by the June, 1995 flood, for the purpose of recovering 1.5 miles of vehicle access along Forest Service Road #64 from Pine Creek Campground to the Snowslide Trailhead. The proposed action would require the relocation of 700-ft of stream channel. The proposed action was analyzed, along with an alternative (trail construction) and the no action alternative (existing conditions) for their effect on relevant watershed and hydrological indicators such as hydrologic flowpaths, soil compaction and disturbance. Fish habitat relevant indicators assessed included large woody debris, number of pools, bankfull width/depth ratio, and water temperature. Cumulative impacts of the alternatives were also addressed. Possible impacts of the project on National Forest recreation and possible impacts on local economy were also analyzed for each alternative. Twenty-two letters from the public response period, and the USFS responses to the letters, are also included in the environmental assessment.

38. **United States Forest Service (USFS). 1997b.** Unpublished field data from West Fork Jarbidge River field survey, October 1997.

These data are from R1/R4 protocol surveys conducted in October 1997. The data cover the area of the West Fork Jarbidge from Pine Creek to Snowslide Gulch, and consist of original data forms and hand written summaries. KEYWORDS: STREAM HABITAT, SUBSTRATE. Source: 5

39. **United States Forest Service (USFS). 1998.** Unpublished field data from West Fork Jarbidge River field survey, July 1998.

These data are from R1/R4 protocol surveys conducted in July 1998. The survey covers the area of the West Fork Jarbidge from Pine Creek to Fox Creek, which was previously surveyed for habitat in 1997 (USFS 1997b). KEYWORDS: STREAM HABITAT, SUBSTRATE. Source: 5

40. **Warren, C.D. and F.E. Partridge. 1993.** Evaluation of the status of bull trout in the Jarbidge River drainage, Idaho. Idaho Bureau of Land Management. Boise, Idaho. Technical Bulletin No. 93-1. February 1993. 20pp. KEYWORDS: DACE, DISTRIBUTION, IDAHO, LENGTHS, MAINSTEM JARBIDGE RIVER, MOUNTAIN WHITEFISH, POPULATION DENSITY, REDBAND, SCULPIN, STREAM HABITAT, SUCKER. Source: 1

The objectives of this study were to determine the current distribution of bull trout in the Jarbidge River drainage in Idaho, to collect biological data from the bull trout population help determine population status, and to determine habitat usage of bull trout in the Jarbidge River. In addition to bull trout, information on redband/rainbow trout and other fish species was collected. A total of 19 sites were surveyed for fish and habitat. Of these, 11 on the mainstem were snorkeled, while five sites on the East Fork Jarbidge and three sites on the West Fork Jarbidge were electrofished. Snorkelers measured fish visually with comparison to a ruler. Habitat was assessed using Idaho Fish and Game standardized stream survey procedures (based on Platts et al. (1983) and Rosgen (1985)). Data reported includes rainbow trout population estimates by sampling site, and counts of other fish species. Length frequency information for rainbow trout and mountain whitefish are also included. No bull trout were sampled which was attributed to excessive water temperatures and low flow conditions at the time of sampling. Habitat of the Jarbidge River system in Idaho was judged as diverse, with high quality substrate present and little evidence of human caused habitat degradation noted.

41. **Weldon, S.J. 2000a.** Jarbidge River watershed stream temperature monitoring 1999. U.S. Fish and Wildlife Service, Nevada Fish and Wildlife Service. Reno, Nevada. Preliminary Draft December 1, 2000. 12pp plus Appendices. KEYWORDS: DISTRIBUTION, LENGTHS, TEMPERATURE. Source: 4

This study examined water temperature data and limited bull trout population data in three selected sites in the Jarbidge River system known to be occupied by bull trout. The sites were the West Fork Jarbidge River, Slide Creek, Dave Creek, and one site on Pine Creek. A total of 31 water temperature loggers (10 on each creek) were installed at the known limit of bull trout distribution, as well as at 600m intervals upstream and downstream. Air temperature loggers were also installed. Temperature data was gathered from June 30 to October 5-6, 1999. In conjunction with the temperature study, survey crews conducted snorkeling surveys up- and downstream of the temperature loggers. Snorkeling activity was ceased when a bull trout was seen. The purpose of this report was to increase the general knowledge of habitat suitability and use by bull trout in selected streams within the Jarbidge River system. No attempt was made to count individual fish or estimate the bull trout population. The data were presented in table form as daily high and low temperature maxima and minima. The appendices included air and water temperature graphs over all stations for each creek.

42. **Weldon, S.J., 2000b.** Unpublished summary field trip report on South Canyon Road-Shovel Brigade impacts and associated habitat survey data. U.S. Fish and Wildlife Service, Nevada Fish and Wildlife Service. Reno, Nevada. July 14, 2000. 4pp (Summary). KEYWORDS: DISTURBANCE, ROADS, SEDIMENT, STREAM HABITAT, SUBSTRATE, WATER QUALITY. Source: 4

This field trip report documented the June 20-22, 2000 efforts to assess and document baseline habitat conditions prior to proposed activities by the Shovel Brigade to reopen the South Canyon Road on July 3-4, 2000. The survey reaches on the West Fork Jarbidge were located from upstream of Snowslide Trailhead to downstream of Pine Creek Campground, and were chosen to reflect areas that may experience direct or indirect effects of the road reopening, as well as upstream control reaches. Multiple cross-sectional transects for data measurements were taken for each reach. Information gathered included water quality data for temperature, conductivity, pH, and dissolved oxygen as well as water depth and velocity measurements, percent substrate composition, and substrate embeddedness. Streambank cover was also assessed, and LWD and large exposed boulders in the channel were counted and classified. In addition to the initial survey, several reaches of the West Fork Jarbidge River impacted by the Shovel Brigades activities were resurveyed on July 5-6, 2000. Stream channel and bank modifications occurring during the road reopening were noted and analyzed. In conjunction with the first habitat surveys, limited and site specific electrofishing and snorkeling occurred in the area of the road reopening, several road washouts, and upstream of Lower Fox Creek Bridge. In the course of these efforts, a total of seven bull trout were seen, although none were present in the immediate area of the road reopening.

43. **Zoellick, B.W., R. Armstrong, and J. Klott. 1996.** Status of migratory bull trout population in the Jarbidge River drainage. Idaho Bureau of Land Management. Boise, Idaho. Technical Bulletin No. 96-5. April 1996. 21pp. KEYWORDS: DACE, DISTRIBUTION, MIGRATION, MOUNTAIN WHITEFISH, POPULATION DENSITY, REDBAND, SCULPIN, STREAM HABITAT, SUCKER, TEMPERATURE. Source: 1

The objectives of this study were to resurvey stream segments previously sampled by Warren and Partridge (1993) during a time when water temperatures were favorable for migratory bull trout, and to determine if migratory bull trout populations were still present in the Jarbidge River drainage. Secondary objectives were the collection of baseline data on pool size and stream depth in possible migratory corridors, and the collection of data on other fish species present. The surveys were conducted during March and July 1994 and August 1995. Methods used include three-pass electrofishing in 100-meter long reaches, and snorkel surveys. A total of five sites on the Jarbidge River were electrofished, two on the West Fork, and three on the East Fork. Snorkeling involved 56 pools and 1158 meters of stream in the mainstem, East Fork, and West Fork of the Jarbidge River, and tributary streams Dave Creek and Jack Creek. In addition, 12 sites totaling 102 m were sampled in Deer Creek, a tributary of the East Fork. All study areas were downstream of the National Forest Boundary. This report includes population estimates of migratory bull trout and redband trout in the East and West Forks of the Jarbidge, as well as for the other fish species detected. Bull trout were observed in the West Fork Jarbidge in 1994, and at the mouth of Jack Creek in 1994 and 1995. The physical stream measurements indicated the West and East Forks Jarbidge River provided suitable bull trout migratory habitat. The lack of bull trout in the East Fork Jarbidge was attributed to survey timing, and hypothesized migratory bull trout movement upstream to an area of more suitable temperature.

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16 NDOW 1972
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Table 1. Fish surveys and fish observations in the Jarbidge River system.

KEY

BT = Bull trout
RB = Redband / rainbow trout
MW = Mountain whitefish
SCP = Sculpin spp.
DA = Dace spp.
SU = Sucker spp.
EB = Eastern Brook trout
CT = Cutthroat trout

A = Investigation of migratory BT population
B = Determination of current BT population distribution
C = Collection of data on other fish species
D = Collection of data on instream habitat and BT habitat usage
E = Collection of BT spawning data

WF = West Fork
EF = East Fork

Reference Number	Authority	Objectives	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
13	NDOW 1954	C	June and August 1954	Electrofishing	WF Jarbidge	5 selected stations from 6250 to 7268ft.	All Present	BT, RB, MW, EB, CT	2	125-175	BT found only at site furthest upstream, elevation 7268.
		C	June and August 1954	Electrofishing	Sawmill Creek	At elevation 7500	All Present	RB			
14	NDOW 1961	C	October 3-4, 1961	Electrofishing	WF Jarbidge	Selected reaches from State line to just upstream of Sawmill Creek	All Present	BT, RB, MW, SCP	3	75-150	BT found only at site furthest upstream, just above Sawmill Creek.
15	NDOW 1962							BT	9	192 mm avg	
16	NDOW 1972	B,C,D	August 24, 1972	Electrofishing	WF Jarbidge	4 selected reaches from National Forest boundary to Snowslide Gulch	All Present	BT, RB, MW, SCP	1	162	BT found at confluence of Jack Creek.
17	NDOW 1974	B,C,D	November 17-18, 1974	Electrofishing	WF Jarbidge	6 selected reaches from State line to Snowslide Gulch	All Present	BT , RB, MW, SCP	0		
18	NDOW 1975	B,C	September 24, 1975	Electrofishing	WF Jarbidge	7 selected reaches from State line to Snowslide Gulch	All Present	BT , RB, MW, SCP	0		
19	NDOW 1979	B,C,D	October 22-26, 1979	Electrofishing	WF Jarbidge	10 selected reaches from Mahoney Ranger Station to Pine Creek Campground	All Present	BT, RB, MW, SCP	2	150-175	This study evaluated the effects of USFS channelization of the WF Jarbidge. 10 reaches (5 channelized , 5 unchannelized) were electrofished. BT were found near bridge just above town of Jarbidge (unchannelized) and bridge just below town (channelized).
20	NDOW 1980	B,C,D	October 22-28, 1980	Electrofishing	WF Jarbidge	6 selected reaches from Mahoney Ranger Station to Pine Creek Campground	All Present	BT, RB, MW, SCP	2 or more	Unknown	This study evaluated the effects of USFS channelization of the WF Jarbidge. 6 reaches (3 channelized , 3 unchannelized) were electrofished. BT were found in one unchannelized and one channelized reach.
21	NDOW 1985	B,C,D	September-October 1985	Electrofishing	WF Jarbidge	17 selected reaches from State line to near Sawmill Creek	All Present	BT, RB, MW, SCP	13	51-255	12 of 13 BT captured in upper WF, from Snowslide Gulch to Sawmill Creek.

Table 1. Fish surveys and fish observations in the Jarbidge River system.

Reference Number	Authority	Objectives	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
36	USFS/NDOW 1993	B,C,D	June-September 1993	Electrofishing	EF Jarbidge	13 stations from NF boundary to headwater forks	All Present	BT, RB, SC, DA	4 <i>x 3 char</i>	103-203	BT captured at elevations of 7280 and 7550.
		B,C,D	June-September 1994	Electrofishing	Cougar Creek	5 stations in lowest 3.9 miles of stream	All Present	RB	0		
		B,C,D	June-September 1995	Electrofishing	Dave Creek and Dave Creek Trib	4 stations in lowest 2.75 miles of Dave Creek, 1 station in trib	All Present	BT, RB	Data Missing		BT captured in Dave Creek, no BT found in Tributary.
		B,C,D	June-September 1996	Electrofishing	Fall Creek and 2 Tribs	Lowest 3.75 miles of Fall Creek, lowest 1.7 miles of tribs	All Present	BT, RB	Data Missing		BT captured in Fall Creek, no BT found in Tributaries.
		B,C,D	June-September 1997	Electrofishing	God's Pocket Creek	5 stations in lowest 3.6 miles of stream	All Present	RB	0		
		B,C,D	June-September 1998	Electrofishing	Jim Bob Creek	3 stations in lowest 2.3 miles of stream	All Present	RB	0		
		B,C,D	June-September 1999	Electrofishing	Robinson Creek	8 stations in lowest 6.2 miles of stream	All Present	BT, RB, SC	Data Missing		
		B,C,D	June-September 2000	Electrofishing	Slide Creek and 2 Tribs	Lowest 5.4 miles of Slide Creek, lowest 1.2-1.5 miles of tribs	All Present	BT, RB, SC	Data Missing		BT present in Slide Creek and both Tributaries.
40	Warren and Partridge 1993	B,C,D	August and September 1992	Snorkel	Mainstem Jarbidge River	RM 1 - 25	All Present	RB, MW, SCP, DA, SU, RS, SQ	0		
		B,C,D	July 1992	Electrofish	WF Jarbidge	RM 0.6, 1.7, 3.4	All Present	RB, MW, SCP, DA, SU	0		
		B,C,D	July and August 1992	Electrofish	EF Jarbidge	RM 0.1-4.1	All Present	RB, MW, SCP, DA, SU, RS	0		
1	BLM and USFW 1995	B,C,D	August 8, 1995	Snorkel	WF Jarbidge	0.4mi below Jack Creek and 0.4 D/S of mouth of Buck Creek.	All Present	RB, MW, SCP, DA, RS	0		5 sites below Jack Creek (Nevada) and one in Idaho.
			August 8, 1995	Snorkel	EF Jarbidge	Confluence of West Fork, 0.3mi D/S and 0.4mi upstream of Murphy Hot Springs	All Present	RB, MW, SCP, DA, SU, RS	0		

Table 1. Fish surveys and fish observations in the Jarbidge River system.

Reference Number	Authority	Objectives	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
43	Zoellick et al. 1996	A,C,D	July 1994	Snorkel	Mainstem Jarbidge River	From 1.3 miles D/S of forks to RM 25	All Present	RB, MW, SCP, DA, SU	0		
		A,C,D	March 1994	Electrofish	WF Jarbidge	RM 0.6 & 3.4	All Present	RB, MW, SCP, DA, SU	0		
		A,C,D	July 1994	Snorkel	WF Jarbidge	From RM 0.6 to USFS Boundary	All Present	BT, RB, MW, SCP, DA, SU	1	175	Observed BT at 1591m elevation. No BT seen at wilderness boundary (elev. 2030-2057m) or near mouth of Pine Creek.
		A,C,D	August 1995	Snorkel	Deer Creek	From RM 0.0 to USFS Boundary	All Present	RB	0		
		A,C,D	July 1994, August 1995	Snorkel	Jack Creek	Sampled at Mouth of Jack Creek	All Present	BT, RB, MW	6	175-225	Sample at plunge pool below culvert barrier. Observed 5 BT in 1994, 1 in 1995.
		A,C,D	March 1994	Electrofish	EF Jarbidge	RM 0.6 & 3.5	All Present	RB, SCP, DA,	0		
		A,C,D	July 1994	Snorkel	EF Jarbidge	From RM 0.85 to USFS Boundary	All Present	RB, MW, SCP, DA, SU, RS	0		
		A,C,D	July 1994	Snorkel	Dave Creek	From Wilkens Island to 2.45 miles U/S of border	All Present	RT	0		
27	Ramsey, 1997a	B,C,D	October 1, 1996	Walk through	WF Jarbidge	From Pine Creek to headwaters	BT	BT	4	175-300	BT were visual observations seen at approximate elevations of 7400-7600 feet (Dry Gulch to above Sawmill Creek)
28	Ramsey, 1997b	B,C,D,E	October 6-8, 1997	Walk through	WF Jarbidge	From Pine Creek confluence to 50 yards below Sawmill Creek.	RB	RB	0		
		B,C,D,E	October 6-8, 1997	Walk through	EF Jarbidge	From the NF Boundary to about .25 miles inside the Wilderness area	BT, RB	BT, RB	3	175-225	BT were observed in beaver dam pool, above Dry Gulch. Two "probable redds" were found above Dry Gulch.
25	Partridge and Warren 1998	A,C	Aug 28-Oct 17 1997	Downstream fish weir / trap boxes	WF Jarbidge	Weir installed 1.7 km upstream from EF confluence	All Present	BT, RB, MW, SCP, DA, SU, RS	1	141	BT captured on August 28.
		A,C	Aug 27-Oct 17 1997	Downstream fish weir / trap boxes	EF Jarbidge	Weir installed 100m upstream from WF confluence	All Present	RB, MW, DA, SU, RS	0		
10	Johnson 1999	B,C	August 5, 1998	Electrofish and Snorkel	WF Jarbidge	From Idaho/Nevada border to headwaters forks	All Present	BT, RB, MW, SCP, DA, SU	23	96-200	20 of the 23 BT collected were in the headwaters, located in the wilderness area (elevation > 7000ft).
		B,C	August 5, 1998; Mid-September 1998	Electrofish	Jack Creek	From confluence with WF to aprox. 7000ft elevation	All Present	RB, SCP	0		One site was in Jenny Creek.

Table 1. Fish surveys and fish observations in the Jarbidge River system.

Reference Number	Authority	Objectives	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
		B,C	August 5, 1998	Electrofish	Pine Creek	From confluence with WF to near headwater forks	All Present	BT, RB, SCP	1	110	BT captured at 7650ft elevation.
		B,C	Mid-September 1999	Electrofish	Fox Creek	From confluence with WF to near headwaters	All Present	RB	0		RB found only at two lower sites.
		B,C	August 5, 1998	Electrofish	Sawmill Creek	Lower 100m of stream sampled	All Present	BT	1	120	
		B,C	August 12, 1998	Electrofish	EF Jarbidge	From confluence of Robinson Creek to headwaters fork	All Present	BT,RB, SCP,DA	8	97-262	BT found just below headwater forks (elevation > 7600ft).
		B,C	August 5, 1998	Electrofish	Dave Creek	From 7000ft elevation to 7600ft elevation	All Present	BT, RB	13	147-213	Elevation of sites with BT ranged from 7280ft to >7540ft.
		B,C	August 5, 1998	Electrofish	Slide Creek	From confluence with EF to near headwaters and major tribs	All Present	BT, RB, SCP	2	101-112	BT found at approximately 7150 elevation
		B,C	August 5, 1998	Electrofish	Fall Creek	Lower reaches of mainstem and two major tribs	All Present	BT, RB, SCP	5	98-155	Elevation of sites with BT ranged from 6640ft to 6840ft.
		B,C	August 25, 1998	Electrofish	Cougar Creek	From confluence with EF to approximately 7000ft elevation	All Present	BT, RB, SCP	3	45-170	Two YOY BT captured at 6960 elevation.
		B,C	August 16, 17, and 19, 1999	Electrofishing	Jack Creek	From elevation 5960 to 6840 feet	BT, RB	BT, RB	14	95-200	BT were found at elevations 6600-6840ft.
		B,C	August 31-September 2, 1999	Electrofishing	Pine Creek	From elevation 7015 to 7675 feet	BT, RB	BT, RB	14	106-296	BT were found at elevations 7280-7675ft. 296 mm BT largest e-fished in Jarbidge drainage.
22	NDOW 2000	B,C,D	September 28-29, 1999	Electrofishing	EF Jarbidge	At elevation 7360 and just upstream	BT, RB	BT, RB	7	55-195	BT represented four age classes.
		A,C	September 9-November 30 1999	Downstream fish weir / trap boxes	WF Jarbidge	Weir installed 10m upstream from EF confluence	All Present	BT, RB, MW, SCP, DA, SU	3	250-355	BT captured on September 29, 30 and Nov 17.
		A,C	September 8-November 30 2000, 1999		EF Jarbidge	Weir installed 100m upstream from WF confluence	All Present	BT, RB, MW, SCP, DA, SU	2	280-315	BT captured on October 24 and 31.
26	Partridge and Warren 2000										
41	Weldon 2000a	D	June 30 and August 24, 1999	Snorkel	WF Jarbidge	From mouth of Pine Creek (elevation 6733ft) upstream to elevation 7370ft	BT, RB	BT, RB	8	127-305	BT seen at elevations of 7134-7370ft.
		D	June 30, August 24, & October 15, 1999	Snorkel	Slide Creek	From elevation 6736-7786ft and major trib	BT, RB	BT, RB	14	89-200	BT seen at elevations of 6736-7572ft.
		D	June 30, 1999	Snorkel	God's Pocket Creek	Lower 50 m surveyed	BT, RB	RB	0		

Table 1. Fish surveys and fish observations in the Jarbidge River system.

Reference Number	Authority	Objectives	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
		D	June 30 and August 24, 1999	Snorkel	Dave Creek	From elevation 6245-6906ft	BT, RB	BT, RB	5	Adult	BT seen at elevations of 6623-683ft.
42	Werdon 2000b	D	June 19-22, 2000	Electrofish and Snorkel	WF Jarbidge	Selected reaches from Pine Creek confluence to wilderness area	BT, RB, SCP	BT, RB, SCP	7	Adult	BT seen at Gorge Gulch, Snowslide Gulch, and Jarbidge Wilderness Area.
2	Burton et al. 2001	D,E	September 12, 2001	Walk through spawning survey	Dave Creek	Reach between elevation of 6280- 7120ft	BT	BT	Multiple	200-350	Actively spawning BT observed throughout reach
23	NDOW 2001	A,B,C	June 27-29, 2000	Snorkeling	WF Jarbidge	Selected reaches from Jack Creek to Pine Creek (3.8 miles total)	All Present	BT, RB, MW,SCP	16	175-350	2 BT adults near Jack Creek confluence, 2 BT juveniles near cemetery bridge, 12 BT from 1st Jarbidge bridge to Pine Creek.
		A,B,C	June 27-29, 2000	Snorkeling	Jack Creek	From WF Jarbidge confluence to 0.5 miles upstream	All Present	BT, RB, MW,DA	2	250-300	
		B,C,D	July 24-26, 2000	Electrofishing	Robinson Creek	Over entire lower 4.9 miles of stream	All Present	RB	0		Lower Jim Bob Creek was also sampled.
		B,C	July 19 and 27, 2000	Electrofishing	Deer Creek	Upstream of National Forest boundary	All Present	RB	1	220	Excessive stream temperatures noted, limiting any juvenile BT production.
		B,C	July 19-20, 2000	Electrofishing	Fox Creek	Lower 0.3 miles of stream	All Present	RB	0		

Table 2. Stream habitat and temperature data in the Jarbidge River system.

KEY

A = Habitat Survey
B = Stream Temperature Study
C = Channel Morphology/ Hydrology Survey

WF = West Fork
EF = East Fork

Reference Number	Authority	Type of Study	Dates of Investigation	Stream Name	Upstream/ Downstream Limits	Comments
34	USFS 1971	A	July 1971	WF Jarbidge	Upstream from Forest Service boundary to near Sawmill Creek	Map not included in notes. Survey used GAWS method with reaches 500 feet long located 0.33 miles apart.
16	NDOW 1972	A	August 1972	WF Jarbidge	4 selected reaches from National Forest boundary to Snowslide Creek	Habitat surveys conducted in reaches that were electrofished.
18	NDOW 1975	A	September 1975	WF Jarbidge	7 selected reaches from State line to Snowslide Gulch	Habitat surveys conducted in reaches that were electrofished.
19	NDOW 1979	A	October 1979	WF Jarbidge	10 selected reaches from Mahoney Ranger Station to Pine Creek Campground	This study evaluated the effects of USFS channelization of the WF Jarbidge. 10 reaches (5 channelized , 5 unchannelized) were surveyed using GAWS method with variable reach lengths.
20	NDOW 1980	A	October 1980	WF Jarbidge	6 selected reaches from Mahoney Ranger Station to Pine Creek Campground	This study re-evaluated the effects of USFS channelization of the WF Jarbidge. 6 reaches (3 channelized , 3 unchannelized) were surveyed.
21	NDOW 1985	A	Sep-Oct. 1995	WF Jarbidge	17 selected reaches from State line to near Sawmill Creek	Habitat surveys conducted in reaches that were electrofished. GAWS protocol used with 1 mile spacing between surveyed reaches.
35	USFS 1992	A	August 1992	Pine Creek	From elevation 6601-8159 feet	Survey used GAWS method.
36	USFS/NDOW 1993	A	June-Sep 1993	EF Jarbidge and Tribs	EF Jarbidge from NF boundary to headwater forks and	A total of 49.5 mi stream surveyed using GAWS method. Tribs included Cougar, Dave, Fall, God's Pocket, Jim Bob, Robinson, and Slide Creeks.
40	Warren and Partridge 1993	A	July - August 1992	Mainstem, EF, and WF Jarbidge	See Table 1	Habitat surveys conducted in conjunction with fish population studies.
1	BLM and USFW 1995	A,B	August 8, 1995	WF Jarbidge, EF Jarbidge, Jack Creek, Deer Creek	See Table 1	Habitat surveys done at Deer Creek only. Water and air temperatures taken at all sites.
43	Zoellick et al. 1996	A	1994-95	Mainstem, EF, and WF Jarbidge. Deer, Jack, and Dave Creeks	See Table 1	Habitat surveys conducted in conjunction with fish population studies.
3	Butler 1997	C	1995-1997	WF Jarbidge	Upstream from NF boundary	Limited temperature data also discussed.

Table 2. Stream habitat and temperature data in the Jarbidge River system.

Reference Number	Authority	Type of Study	Dates of Investigation	Stream Name	Upstream/ Downstream Limits	Comments
27	Ramsey, 1997a	A	April 30 and October 1, 1996	WF Jarbidge	From confluence with Pine Creek to between the Fox Creek Bridges (Habitat) and Dry Gulch (LWD)	Survey was after 1995 flood. LWD survey classified wood into size classes in vehicle accessible/non-accessible reaches.
28	Ramsey, 1997b	A	October 6-8, 1997	WF Jarbidge	From Pine Creek confluence to 50 yards below Sawmill Creek.	"Walk through" to search for spawning habitat.
38	USFS 1997b	A	October 1997	WF Jarbidge	From Pine Creek to Snowslide Gulch	R1/R4 protocol used for stream surveys.
25	Partridge and Warren 1998	B	Aug 28-Oct 17 1997	WF and EF Jarbidge	See Table 1	Thermographs set up in conjunction with fish weirs.
39	USFS 1998	A	July 1998	WF Jarbidge	From Pine Creek to Fox Creek	R1/R4 protocol used for stream surveys. Previously surveyed in 1998
10	Johnson 1999	B	July - October 1998	WF Jarbidge, Jack Creek, Slide Creek, Trib B of Slide Creek	See Table 1	Thermographs set up in conjunction with electrofishing sites.
22	NDOW 2000	B	July - October 1999	EF Jarbidge, Jack, Pine, Robinson, Fall, Dave and Cougar Creeks	See Table 1	Thermographs set up in conjunction with electrofishing sites.
26	Partridge and Warren 2000	B	Sep 8-Nov 30 2000	WF and EF Jarbidge	See Table 1	Thermographs set up in conjunction with fish weirs.
2	Burton 2001	A	September 2001	Dave Creek	Reach between elevation of 6280- 7120ft	Study focused on substrate and sediment.
23	NDOW 2001	B	2000	Bear Creek, Deer Creek, Fox Creek	See Table 1	Thermographs set up in conjunction with electrofishing sites.
41	Werdon 2000a	B	July-October 1999	WF Jarbidge, Slide Creek, Dave Creek	See Table 1	Air and water temperature loggers set up in conjunction with snorkeling surveys.
42	Werdon 2000b	A,B	June 2000	WF Jarbidge	Selected reaches from Pine Creek confluence to wilderness area	Stream habitat data and limited temperature data taken to document baseline habitat conditions in disturbed reach.

Table 3. Angler use and creel check data for the Jarbidge River system.

KEY
WF = West Fork
EF = East Fork

Reference Number	Authority	Dates of Investigation	Methods	Stream Name	Upstream/ Downstream Limits	Species Investigated	Species Present	Number of char	Size Range of Char (mm)	Comments
15	NDOW 1962	June 19 to August 26, 1962	Creel Checks	WF Jarbidge	Unknown	All Present	BT, RB, EB, MW	9	192 Average	
18	NDOW 1975	September 1975	Angler Survey	WF Jarbidge	From State line to Snowslide Creek	All Present	RB	0		Angler survey of seven anglers in conjunction with population survey.
8	Johnson 1990	1962-1989	Creel Checks	Jarbidge River System	Not applicable	All Present	Various	Various	Various	Summary of all historical creel data.
9	Johnson and Weller 1990	1958-1979	Angler Use	Jarbidge River System	Not applicable	All Present	Various	Various	Various	Summary of all historical angler use data.